m/047/007

SF Phosphates Limited Company
A Utah Limited Liability Company
9401 North Hwy. 191
Vernal, UT 84078-7802
(435) 789-7795

December 9, 1999

Mr. Lynn Kunzler
Utah Division of Oil, Gas, and Mining
1594 West North Temple
Salt Lake City, UT 84114-5801

Dear Mr. Kunzler,

Enclosed is a copy of the proposed test plot study for the reclamation of the SF Phosphates tailings storage facility. This study plan has been submitted for approval in response to the Division's comments dated May 20, 1999 to the Notice of Intention to Revise Large Mining Operations, Tailings Storage Facility.

Inform us as to the acceptability of this study plan and any modification that may be required. We intend to incorporate this study plan in the Notice of Intention to Revise Mining Operations on which we are currently working.

Please contact me at 435-781-3348 if you have any questions.

Sincerely,

Ron Ryan

Ron Ryan
Environmental Specialist

Enclosure

Proposed Test Plot Study

Purpose and Scope

The purpose of the study is to determine the methods and materials that will produce the best results when reclamation of the tails impoundment occurs. This determination will be achieved through the establishment and subsequent monitoring of test plots planted on tailings material. Several treatments, including various seed mixtures, fertilizers, and organic amendments will be tested and their efficacy measured over several years. The results of the test plots will then aid in determining the methods to be used in the eventual tails impoundment reclamation.

Study Area Description

The location chosen for the study site is a borrow area below the south end of the dam. The site presently has an area of approximately 80,000ft^2 and is capable of containing a volume of approximately 480,000ft^3. The site is also located above the seepage containment cut-off system which will prevent the loss of tails water into down- gradient water sources.

Study Site Preparation

Site preparation will involve the building up of burms that will contain the tailings eventually placed into the site. Additionally, any fractures or holes found in existing burms will be sealed to prevent any tailings loss.

Tailings Delivery

Tailings will be delivered from the mill tailings discharge to the study area by way of a 6-inch pipeline. These tailings will be allowed to fill the study area, settle, and dewater, leaving a layer of solid tailings. This process will be repeated until the tailings fill the study site volume with a solid planting substrate. The tailings will average six feet in depth upon completion.

Study Site Establishment

After the solid tailings are in place approximately 25-30 test plots will be established on the tailings substrate. These plots will be 10m x 10m and will be separated from each other by several feet on all sides. Each one of the plots will be assigned a planting treatment.

Treatments

The various treatments used in the study will differ from one another in the following areas:

1. Type of seed mixture used
2. Type of organic amendment used
3. Fertilizer used

Seed Mixture

Two types of seed mixtures will be used in the study. These mixtures will contain grasses, forbs, or shrubs that are tolerant to silt and clay and are suited for the climate. The seed mixtures that will be used in the study are shown below:

Mixture #1 (Mine Mixture)

Common Name	Rate lbs/ac (PLS)
'Hycrest' crested wheatgrass	1.1
Intermediate wheatgrass	2.2
Orchard grass	1.1
Basin wildrye	3.3
Indian ricegrass	3.3
Ladac alfalfa	2.2
Yellow sweetclover	1.1
Palmer penstemon	1.1
Small burnet	3.3
Mountain big sagebrush	0.2
Wyoming big sagebrush	0.2
4-Wing saltbrush	2.2
Rubber rabbitbrush	0.5
Forage kochia	1.1
Bitterbrush	2.1
Total	25.0 lbs./ac.

Mixture #2 (Nurse Crop)

Common Name	Rate lbs/ac (PLS)
'Hycrest' crested wheatgrass	1.5
Orchardgrass	1.5
Intermediate wheatgrass	3.0
Basin wildrye	4.5
Ladac alfalfa	3.0
Yellow sweetclover	1.5
Total	15.0 lbs/ac

Organic Amendments

Two types of organic amendments will be tested in this study: hay, and nurse crop. The hay mulch will be identical to that used in other reclamation efforts throughout the mine.

In some treatments, a nurse crop will be planted and allowed to develop. This nurse crop will then be tilled under and will serve as the organic amendment for the subsequent final cover seed mixture.

Fertilizer

A fertilizer mixture containing Phosphorus, Nitrogen, and Potassium will be used in most of the treatments. Some treatments will be without the fertilizer mixture for comparison purposes.

Using various combinations of the factors discussed above, eight tentative treatments were formulated. These treatments are shown in the below table:

Treatment #	Seed Mixture	Organic Amendment	Fertilizer
1	#1	Hay	Yes
2	#1	None	Yes
3	#1	Hay	No
4	#1	None	No
5	#1	Nurse Crop	Yes
6	#1	Nurse Crop	No
7	#2	None	Yes
8	#2	None	No

*Nurse crop will be broadcast over the tails while they are still wet.
*Treatments 5 and 6 will be planted on plots 7 and 8 after the nurse crop has been tilled.

Replicates of each treatment will be planted in different plots throughout the study area.

Monitoring

Monitoring of the test plots will begin the year following planting and will continue on an annual basis. Monitoring will include measurement of densities and covers of the various treatments to determine which produces the best results.

Monitoring Procedures

Density

1. Each test plot will be divided into a 10mx10m grid using stakes placed on two sides of each plot. Each square in the grid will be assigned a number that will aid in the random selection of sampling sites. A random drawing of numbers will determine the sites selected for sampling.

2. Once a sampling site has been selected, a $1m^2$ quadrat is dropped in the site and each species and the number of individuals is recorded. 3. If a question arises as to whether a plant is inside or outside the quadrat, the following determination is made:

    - If the plant is touching the top or right borders of the quadrat, the plant is counted.
    - If the plant is touching the bottom or left borders of the quadrat, the plant is not counted.

3. These data can be used to calculate absolute and/or relative densities.

Cover

1. A transect is run from one corner of the test plot to the opposite corner in a diagonal fashion.

2. Moving down the transect, plant species names are recorded for those plants whose canopies are intercepted by one edge of the tape. In addition, the length of the transect line covered by each plant canopy is recorded to the nearest cm. Bare ground and litter are also measured.

3. These data can be used to calculate percent cover.

4. This procedure is repeated with the transect running in the opposite diagonal direction.

In order to evaluate molybdenosis risk, plant tissue samples will also be collected from several plots for molybdenum/copper analysis.